Influence of DSC and TG Test Conditions on the Thermal Behavior of Diclofenac Sodium

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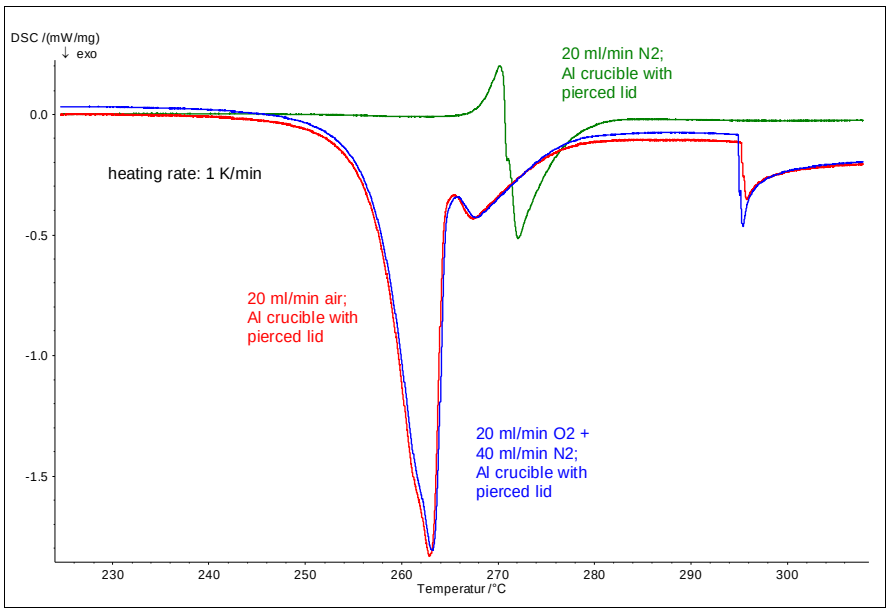
Analgetics are common drugs in human medicine. One widespread drug substance in this context is diclofenac. Sodium salt shows a melting point of approx. 285°C (1), strongly overlapped by decomposition. In how far melting is affected by this decomposition depends on the experimental conditions (P. Tudja et al. (2)).

In this contribution, various measurement techniques – differential scanning calorimetry (DSC), thermogravimetry (TG) and thermogravimetry coupled with FTIR spectroscopy – as well as the NETZSCH thermokinetics software were used to further investigate the thermal behavior of diclofenac sodium. The material was tested by variation of the atmospheric conditions, heating rates, and pressure.



In an oxidizing atmosphere, a big exothermic effect is visible below the melting temperature. Since, at the same time, a mass loss of only approx. 5 - 6% occurs, it seems that most of the material is changing in this temperature range so that no melting peak can be determined any more. Under inert conditions, the detected mass loss is almost the same but the starting point is shifted to a slightly higher temperature and it does not affect the endothermic melting peak that strong. The main decomposition (exothermic) of the material – in an inert gas atmosphere - occurs later and seems to follow another reaction path.

References:

(1) www.chemistryworld.de/cheminfo/diclolex.htm
(2) P. Tudja, M.Z.I. Khan, E. Meštrović, M. Horvat and P. Golja, Cham. Pharm. Bull., 49 (2001) 1245.
(3) E. Marti, E. Kaisersberger, G. Kaiser, W.-Y. Ma, NETZSCH Annual 2000, Thermoanalytical Characterization of Pharmaceuticals